

STUDIES IN ANNONACEAE. XV. A TAXONOMIC
REVISION OF *DUGUETIA* A. F. C. P.
DE SAINT-HILAIRE SECT. *GEANTHEMUM*
(R. E. FRIES) R. E. FRIES (ANNONACEAE)

P. J. M. Maas, L. Y. Th. Westra, N. A. J. Meijdam, I. A. V. van Tol¹

ABSTRACT - The section *Geanthemum* of the large genus *Duguetia* is revised. Three species are currently recognized. Some remarks are made on the specialized way of flowering on long runners on the ground. This paper forms a precursor to the future monograph of *Duguetia* in *Flora Neotropica*.

KEY WORDS: *Duguetia*, *Geanthemum*, *Annonaceae*, Taxonomic revision

RESUMO - Foi revista a Secção *Geanthemum* pertencente ao amplo gênero *Duguetia* e três espécies foram consideradas realmente válidas. São apresentadas observações sobre a maneira peculiar de floração em estolhos alongados e rentes ao solo. Este trabalho constitui um precursor integrante de futura monografia sobre o gênero *Duguetia* na *Flora Neotrópica*.

PALAVRAS-CHAVE: *Duguetia*, *Geanthemum*, *Annonaceae*, Revisão taxanômica

¹ Department of Plant Ecology and Evolutionary Biology, Herbarium Division, University of Utrecht, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands



INTRODUCTION

Among the 14 sections established by Fries in the large genus *Duguetia* (1934, 1937), Sect. *Geanthemum* is extremely well-marked by the combination of both cauliflory and flagelliflory. Flowers are borne on long, nearly always leafless shoots that originate from the trunk and creep over the ground, sometimes reaching a length of several meters. When Fries published his comprehensive treatment of the genus (1934), he recognized three species in Sect. *Geanthemum*. In 1941 he added two more species. Later again, another two species were added by Jansen-Jacobs (1970). Extensive study of the material now available has made clear, however, that there are actually three species. The type species is endemic to the State of Rio de Janeiro, Brazil. The two other species inhabit the Guianan and Amazonian region.

TAXONOMIC HISTORY

In 1883 Eichler described a flagelliflorous species of *Annona*, *A. rhizantha*, from Serra da Bica in the surroundings of Rio de Janeiro, Brazil.

Fries (1900) transferred *Annona rhizantha* to the genus *Aberemoa*, and placed it in a monotypic section *Geanthemum*, characterized by: scale-like or stellate hairs; outer petals apert, inner petals imbricate; stamens all fertile, not widened beyond the loculi [i.e., connective without apical prolongation], and fruit composed of loosely connected ("laxe coalitis") carpels. The peculiar inflorescence also gets due attention.

The next two species were described by Huber (1909), this time in *Duguetia*, viz. *D. flagellaris* and *D. cadaverica*. At the same time, Huber transferred *Annona rhizantha* to *Duguetia*.

Safford, in his study of *Annona* (1914), elevated *Aberemoa* Sect. *Geanthemum* to generic rank. In *Geanthemum* he also included *Duguetia cadaverica*, but spent no word at all on *Duguetia flagellaris*. Safford found *Geanthemum* to resemble *Raimondia* in the form of the stamens, but to differ from that by bisexual flowers, fruit with easily separable carpels, and a stellate-lepidote indument. In the two latter features it resembled *Duguetia*, but it differed "radically from that genus and from *Annona* by its peculiar stamens."

In 1934 Fries argued that Sect. *Geanthemum*, with the three constituent species, should remain in *Duguetia* (syn.: *Aberemoa* for the greater part) because of good match of vegetative and fruit characters. As regards floral characters, there are differences worth noting, however. The petals are not as



strongly imbricate as in other *Duguetia* species. This is most marked in *D. sessilis* (as *D. rhizantha*), where the outer petals are apert except for the imbricating tips, and only the inner petals distinctly imbricate. The petals are also thinner and longer/narrower than in most *Duguetia* species. The absence of a prolonged connective, for Safford the main reason to elevate the section to generic rank, is considered an important character (state) by Fries. At the same time, though, Fries rightly points out that this character is variable in some genera, e.g., in *Annona* (the *Anonella* group). Furthermore, in *D. flagellaris* the connective is prolonged in the way typical for the genus (this most likely was the reason for Safford not to include it in *Geanthemum*).

Fries's argument is supported by our own research, which not only has confirmed the presence of a prolonged connective in all specimens of *D. flagellaris* we could examine, but has also shown that the shape of the connective is very variable in *D. cadaverica*.

In later years four more species were described in Sect. *Geanthemum* (Fries, 1941; Jansen-Jacobs, 1970).

A NOTE ON THE FLAGELLIFLORY IN *DUGUETIA* SECT. *GEANTHEMUM*

Duguetia Sect. *Geanthemum* is highly distinct by the combination of cauliflory and flagelliflory. Flowers are produced exclusively on long, generally leafless runners that spring from the trunk at ground level, or some of them higher up or from the lowermost large branches (Figure 1A). Runners coming from above the ground first grow downward, then all runners grow horizontally. Both runners creeping over the ground and those creeping underground have been observed by collectors. The length of such runners varies widely, from less than 20 cm to several meters in older specimens (Ducke has reported an extreme length of 10 m).

In the species described and pictured by Eichler, *D. sessilis* (as *D. rhizantha*), the runners are manifestly sympodial and are built up of successive lateral shoots. Each shoot mostly consists of two long internodes and then terminates in a rhypidium which is the basic inflorescence element characteristic of Annonaceae (Fries, 1919, 1959). As a result, the rhypidia are secund (Figure 2A). Sometimes there is only one internode prior to formation of a rhypidium, which results in a zigzag arrangement of rhypidia as shown by Fries (1949, 1959). Ramification of flagella, as clearly shown in Eichler's



figure, is effected by lateral shoots from axillary or, at least in some cases, auxiliary buds in the axils of bracts. With only herbarium material at hand, it is often difficult to determine whether it is in the one or in the other way, not in the least because the ramification pattern is complicated by processes of coalescence between shoots of subsequent order, and also between shoots and foliar tissue. This is a common feature of Annonaceae (see, for instance, Fries, 1919: 8, or Fries, 1959: fig. 11C). Also, the attachment of a bract or leaf may not coincide with the true point of insertion. The growth pattern of an inflorescence should therefore be studied through observation of successive stages in living material, if feasible.

In *D. flagellaris* the growth pattern of the inflorescences is largely the same as in *D. sessilis*. Here, sympodial units were found to comprise two (or perhaps occasionally more) internodes. Uninodal arrangements, like in *D. sessilis*, were not observed.

A rather different look has *D. cadaverica*, as indicated by Huber's (1909) phrasing "Inflorescentiae in ramis subterraneis flagellaribus (...) sympodialibus pseudolaterales *elongatae* ..." [author's italics]. If the rhipidia proper in the two preceding species are rather conform the general type in the genus, i.e., with compact sympodial rachis, here the rhipidia themselves become greatly elongate due to stretching of the sympodial rachis. The result is that runners at least to a large extent are made up of such stretched rhipidia (Figure 2B). Ramification takes place, too. Here probably mostly through auxiliary buds (Figure C). However, the occurrence of axillary buds is not to be ruled out. Again, prolonged study of living material would be in order.

Flowering from long runners on the ground is known in two other, unrelated, genera of Annonaceae, namely *Hornschuchia* (Fries, 1949; Maas et al., 1986) and *Anaxagorea floribunda* (Maas & Westra, 1985). The red color of the flowers reported for the latter is a further interesting parallel with *Duguetia* Sect. *Geanthemum*. No observations of insect visits ever seem to have been made.

SYSTEMATIC TREATMENT

Duguetia A. F. C. P. de Saint-Hilaire Sect. *Geanthemum* (R. E. Fries) R. E. Fries, Acta Horti Berg. 12(1): 96. 1934. Type: *Duguetia rhizantha* (Eichler) Huber (= *Annona rhizantha* Eichler) = *Duguetia sessilis* (Velloso) Maas.



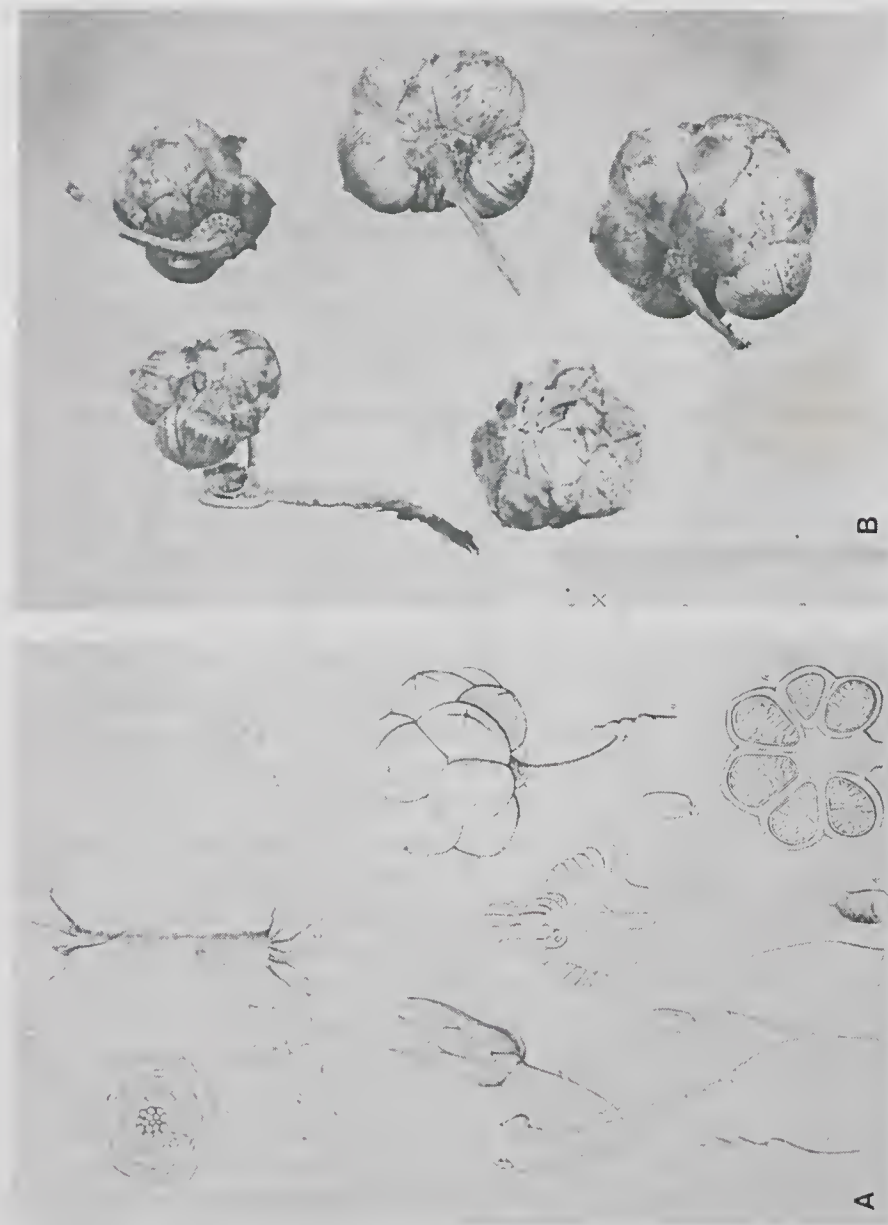


Figure 1. *Duguetia sessilis*. A. Fichler's plate in Jahrb. Königl. Bot. Gart. Berlin 2: pl. XI (as *Annona rhizantha*). B. Live fruits (Farney 2459, photograph by L. Y. Th. Westra).



Figure 2 - Inflorescence branching patterns in *Duguetia* Sect. *Geanthemum* (schematic). A. *D. sessilis* and *D. flagellaris*; part of runner (flagellum) with two rhipidia. B, C. *D. cadaverica*; (B) end of runner clearly showing a rhipidium with greatly elongate sympodial rachis; (C) ramification probably resulting from auxiliary bud formation.

Aberemoa Aublet Sect. *Geanthemum* R. E. Fries, Kongl. Svenska Vetenskapsakad. Handl. n.s. 34(5): 24. 1900. Type: *Aberemoa rhizantha* (Eichler) Huber (*Annona rhizantha* Eichler).

Geanthemum (R. E. Fries) Safford, Contr. U.S. Natl. Herb. 18: 66. 1914. Type: *Geanthemum rhizanthum* (Eichler) Safford (*Annona rhizantha* Eichler).

Shrubs to trees. Twigs ribbed or grooved, sparsely to rather densely covered with brown to orange stellate scales and stellate hairs (becoming glabrous in age). Leaves petiolate. Lamina elliptic to ovate to slightly obovate to narrowly so, herbaceous to chartaceous, base attenuate to acute, apex acuminate to acute, upper side glabrous, lower side sparsely to rather densely covered with entire scales and stellate hairs, primary vein raised to impressed on the upper side, secondary veins recurved to curved to abruptly curved, raised on the upper side, 6-20 on either side of primary vein, angle with primary vein (45°) 60°-80°(-85°), loop-forming at almost right to obtuse (sometimes acute) angles, loops distinct, the distance between loops and margin (0.3-)1-5 mm, tertiary veins raised on upper side, reticulate, marginal vein sometimes present. Inflorescences flagelliform, originating from the trunk at ground level or some distance above the ground, creeping over or (partly) under the ground and producing distant flowers, of two different kinds: (1) a sympodium formed by successive axillary shoots, each of which generally comprising two internodes and then terminating in a contracted rhipidium such as generally found in the genus, the whole inflorescence usually branching by axillary or auxiliary buds; or (2) consisting of one to several greatly elongate rhipidia, the branching probably effected through auxiliary buds. Bracts two to the pedicel, the lower bract just below the articulation, the upper bract inserted in the lower 1/4th to halfway or slightly beyond halfway the pedicel, sympodial bracts similar to pedicellar bracts, mostly caducous, sometimes foliaceous and persistent. Indument of inflorescences (including fruit) consisting of entire, fimbriate or stellate scales, and stellate hairs; sympodial parts, pedicels, flower buds, outer side of sepals and outer petals, and inner side of inner petals, sparsely to densely covered with with entire to stellate scales, and stellate hairs; inner side of sepals and outer petals, and outer side of inner petals, sparsely to densely covered with only stellate scales, as well as stellate hairs. Flower buds ovoid to spheroid 2-18 mm long, creamy, yellow or pink (in vivo). Flowers red, purple or brown (in vivo), the inner petals sometimes with a white inner base. Sepals pink, purplish, brown or pale green (in vivo), connate at base, ovate to broadly ovate, acute at the apex, much shorter than the petals. Outer and inner petals elliptic to ovate, to 28(-33)



mm long. Inner petals sometimes with fleshy tissue at the base. Torus depressed ovoid. Stamens 25-100, apical prolongation of connective well developed or indistinct. Carpels 20-30, rather to very densely covered with stellate hairs or stellate scales at the base, usually glabrous at the apex. Fruit apocarpous, but seemingly syncarpous by closely crowded carpels, dark to pale brown (in vivo), transversely ellipsoid to spheroid, to 4.5 cm long, basal collar usually lacking, when present composed of 7-9 sterile carpels, fertile carpels (6-)9-28, broadly depressed obovoid-obtrulloid to spheroid, to 2.5 cm long, apiculate. Seed 1 per carpel, light to dark brown, sometimes shiny, filling up the cavity, surface smooth or with striae.

Distribution (Figure 3). Throughout tropical South America; number of species: 3.

Key to the species

1. Primary vein of lamina raised to flat on the upper side; marginal vein absent.
Brazil (Rio de Janeiro)..... 1. *D. sessilis*.
1. Primary vein of lamina impressed on the upper side; marginal vein present.
 2. Bracts of flagella caducous; petals concolorous, mostly red. Throughout tropical South America, but not in the Guianas 2. *D. flagellaris*.
 2. Bracts of flagella persistent; inner petals bicolorous, red with white base.
Guianas and Brazil (Pará). 3. *D. cadaverica*.

1. *Duguetia sessilis* (Velloso) Maas, comb. nov. Figures 1, 4.

Uvaria sessilis Velloso, Fl. flum. 225. 1829; Icones 5: t. 125. 1831; Safford, Contr. U.S. Natl. Herb. 18: 67. f. 75. 1914. Type: Velloso's plate cited here.

Annona rhizantha Eichler, Jahrb. Königl. Bot. Gart. Berlin 2: 322. t. 11. 1883.
Type: Brazil. Rio de Janeiro: Cascadura, Serra da Bica, Jan 1882 (fl, fr), Peckolt 1 (holotype, B, 2 sheets; isotypes, L, S).

Aberemoa rhizantha (Eichler) R. E. Fries, Kongl. Svenska Vetenskapsakad. Handl. n.s. 34(5): 24. t. 2, f. 11. 1900.

Geanthemum rhizanthum (Eichler) Safford, Contr. U.S. Natl. Herb. 18: 66. pl. 41. 1914.

Duguetia rhizantha (Eichler) Huber, Bol. Mus. Paraense Hist. Nat. 5: 356. 1909; R. E. Fries, Acta Horti Berg. 12(1): 100. 1934.



Shrub or tree to 6 m tall, 7.5-12.5 cm in diam. Young twigs ribbed, rather densely covered with orange entire scales (0.1-0.2 mm in diam.), becoming glabrous in age, older twigs sulcate. Petiole 1-4 mm long, 0.1-1 mm in diam., indument as on young twigs. Lamina elliptic to ovate to slightly obovate to (narrowly) so, chartaceous, green to greenish brown on both sides, 3.3-15 cm long, 1.5-4.5 cm wide, index 2.2-3.3, upper side glabrous, lower side rather densely covered with orange entire and stellate scales (0.1-0.2 mm in diam.), base narrowly cuneate to attenuate, apex acuminate to acute, primary vein raised to flat on the upper side, secondary veins raised on the upper side, curved, (6)9-16 on either side of primary vein, angles with primary vein 60° - 80° , loop-forming at almost right to obtuse angles, loops distinct, smallest distance between loops and margin (0.3-)1-2 mm, tertiary veins raised on upper side, reticulate, marginal vein absent. Inflorescences sympodial with superposed rhipidia, 12-95 cm long, 1.5-6 mm in diam. Rhipidia spaced at a distance of 3-12 cm, most often separated by 2 internodes, sometimes only a single internode apart. Rhipidia 3-30-flowered, on peduncles 0-20(-25) mm long, 1.5-2 mm in diam., the sympodial rachis (2-)5-35 mm long, pedicels 15-35 mm long, 1.5-2 mm in diam., up to 2.5 mm in diam. just below flower, fruiting pedicels not increased in length. Bracts broadly to depressed ovate, (0.5-)1-4.5 mm long, or sometimes the sympodial bracts foliaceous. Inflorescences including outer side of bracts and flower buds densely to very densely covered with orange stellate and entire scales (0.1-0.2 mm in diam.); outer side of sepals and petals, and fruits, very densely covered with orange stellate scales and orange to white stellate hairs, the inner side of sepals and inner petals very densely covered with white stellate hairs (0.1-0.2 mm in diam.); sepals and petals becoming glabrous toward the base. Flower buds broadly ovoid, 2-7 mm long, 1.5-6 mm in diam. Flowers red to pink (in vivo). Sepals connate at the base, ovate, 7-13 mm long, 3-10 mm wide, acute. Outer and inner petals subequal, narrowly elliptic to narrowly ovate, 20-40 mm long, 5-9 mm wide, acuminate; inner petals thickened, concave and ribbed toward the base. Torus depressed ovoid, 1.5-2 mm long, 3-5 mm in diam. Stamens 25-75, 0.7-1.2 mm long, 0.3-1 mm wide, apical prolongation absent or up to 0.1 mm long, glabrous. Carpels 15-25, very densely covered with stellate scales at the base, glabrous otherwise, the stigma blackish. Fruit pinkish-white (in vivo), transversely ellipsoid, 25-30 x 30-45 mm, basal collar absent; carpels 9-14, broadly to depressed obovoid, 15-25 mm long, 15-20 mm in diam., with prominent ribs forming a 4-angled top, apiculate (apicule 1.5-2 mm long). Seed dark brown, broadly obovoid, 12-15 x 11-13 mm, surface smooth.



Distribution. Brazil, State of Rio de Janeiro; endemic. In forests (a.o., restinga forests), altitude not recorded. Flowering and fruiting from November through April.

Specimens examined. BRAZIL. Rio de Janeiro: Mun. Saquarema, Fazenda Ipitangas, Praia de Massambaba, 7 Mar 1986 (fl), *Araujo et al.* 7266 (GUA, U); Mun. Saquarema, Reserva Ecológica Estadual de Jacarepá, Restinga de Ipitangas, 16 Nov 1990 (fl, fr), *Farney* 2459 (U); Fortaleza, São João, Guanabara, 1915, 1916 (fl), *Frazão RB7140* (MO, S, U); Serra da Bica, near Cascadura, 10 Dec 1882 (fl), *Glaziou & Peckolt 13511* (BR, C, ECON, F, G, K, MG, NY, P, US); Serra da Bica, near Cascadura, 10 Dec 1886 (st, fl), *Glaziou 15823* (BR, C, K, P); "Canal de Macahé" near Imbetiba, 30 Dec 1891 (fl), *Glaziou 18842* (A, C, ECON, K, NY, P); Jacarépagua, Mar 1918 (fl), *Hoehne 133 = SP24595* (S); between Saquarema and "Geitado", Feb 1817 or 1818 (fl), *Mikan 7* (G); Serra da Bica, 15 Apr 1897 (st), *Ule s.n.* (HBG).

Nomenclatural note. As the original material of *Uvaria sessilis* collected by Velloso near Rio de Janeiro ("Habitat maritimis. Floret mensibus calidis") could not be traced, his plate in *Icones* 5, t. 125 is designated here as lectotype.

Duguetia sessilis is easily distinguished from both other representatives of this section by the raised to flat (not impressed) primary vein on the upper side of the leaf. Some field characteristics of this species (fide Peckolt in Eichler, 1883. p. 320) are, e.g., very hard wood, sapwood yellow, bark with smell of nutmeg.

2. *Duguetia flagellaris* Huber, Bol. Mus. Paraense Hist. Nat. 5: 355. 1909; R.E. Fries, Acta Horti Berg. 12(1): 102. 1934. Type: Brazil. Pará: Rio Cuminá-mirim, 12 Dec 1906 (fl), *Ducke MG7942* (holotype, MG; isotypes, BM, F, G). Figure. 5, 6, 7, 8A.

Duguetia heteroclada R. E. Fries, Acta Horti Berg. 13(3): 113. 1941. Type: Brazil. Amazonas: São Gabriel da Cachocira, Upper Rio Negro, near Serra Cabary, 30 Oct 1932 (fl), *Ducke 17 = RB23906* (holotype, S; isotype, RB).

Duguetia trichostemon R. E. Fries, Acta Hort Berg. 13(3): 114. 1941. Type: Colombia. Sur de Santander: near Barranca Bermeja, Magdalena Valley, between Río Sogamoso and Río Colorado, alt. 100-500 m, 31 Jan 1935 (fl), *Haight 1554* (holotype, S; isotypes, F, US).

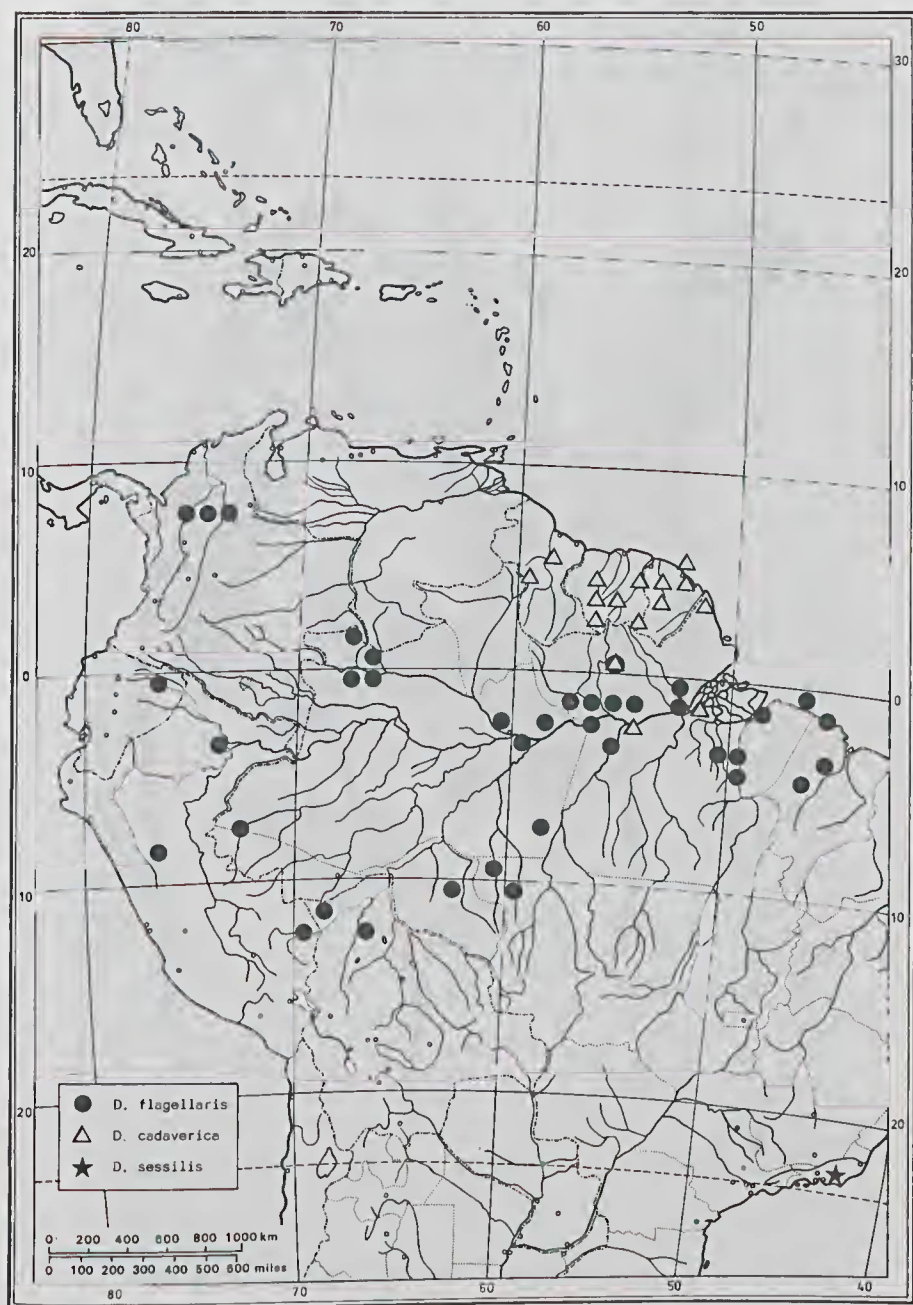


Figure 3 - Distribution map of *Duguetia* Sect. *Geanthemum*.



Figure 4 - *Duguetia sessilis* (Glaziov 13511).

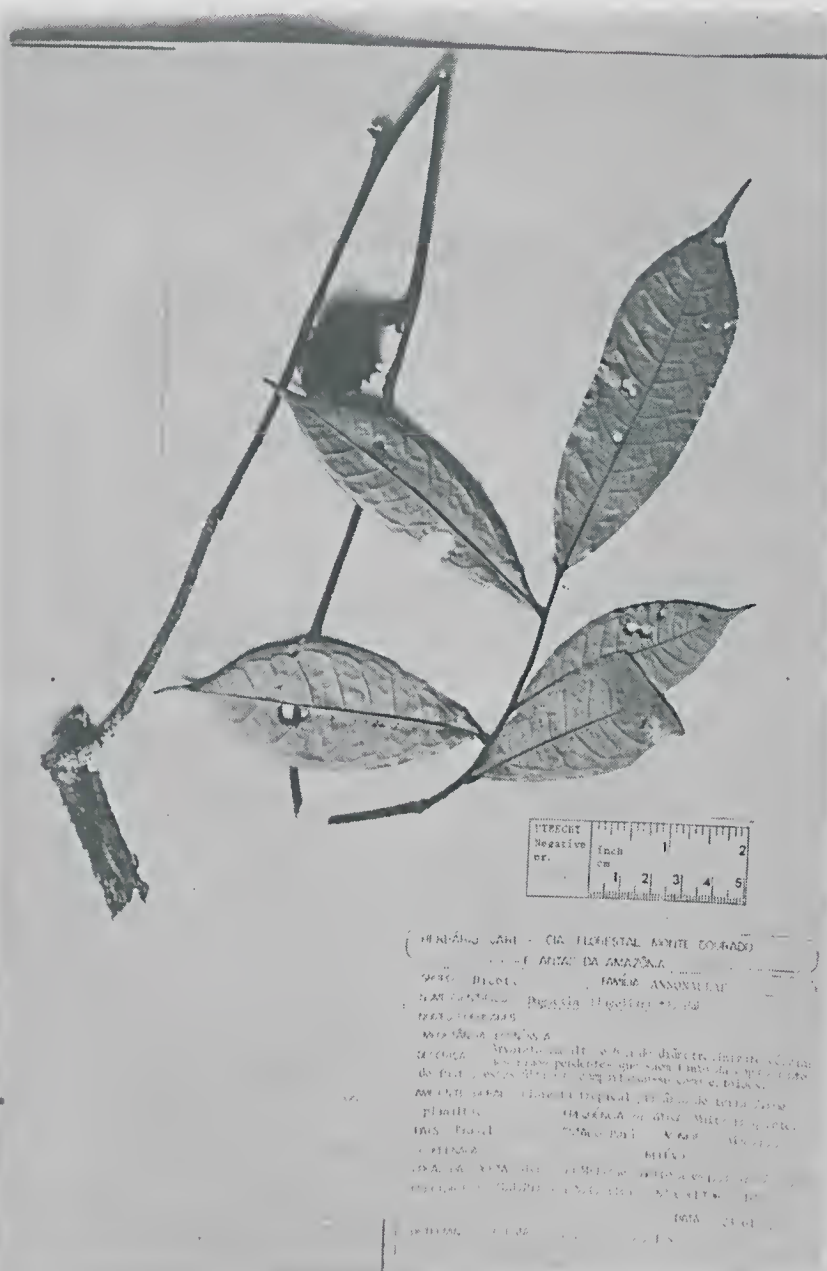


Figure 5 - *Duguetia flagellaris* (Pires & Silva 1623).

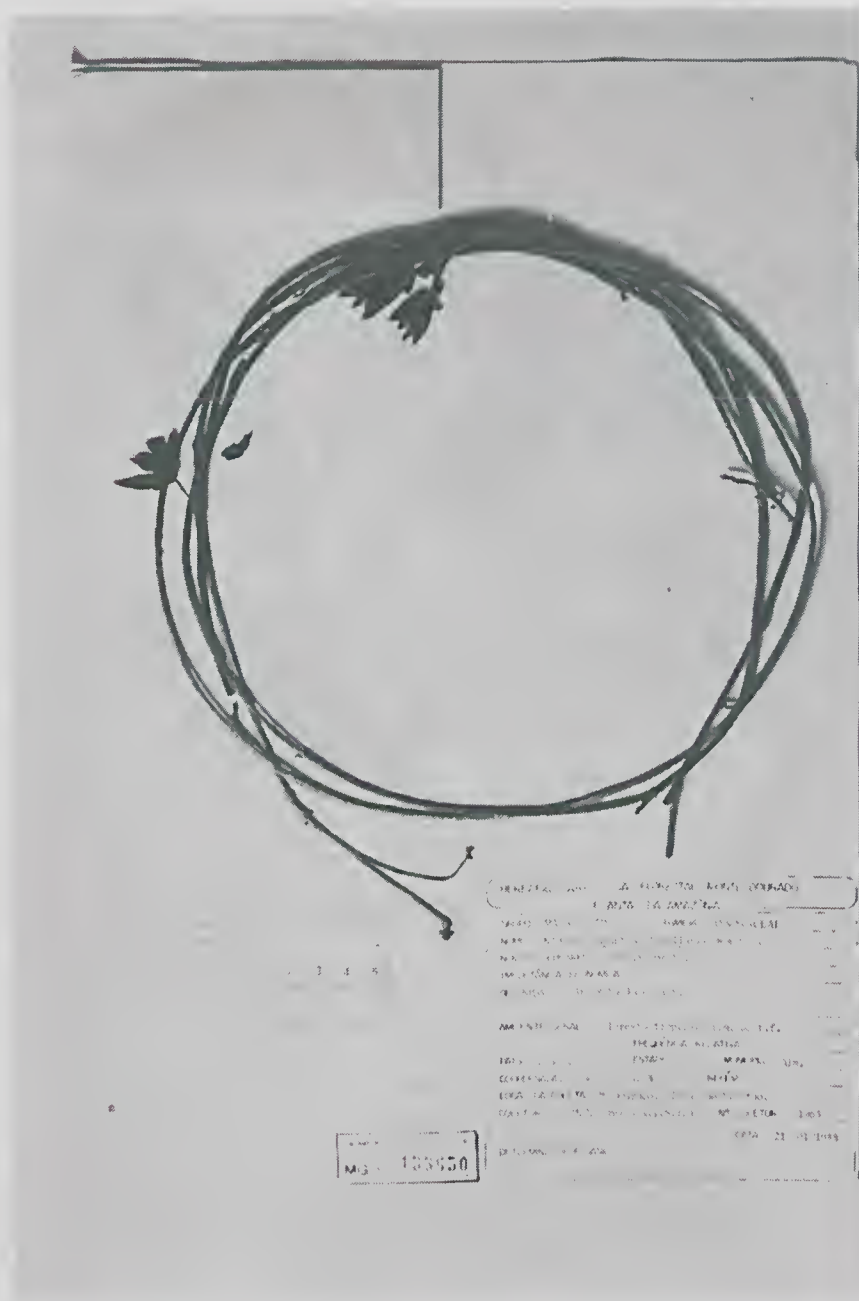


Figure 6 - *Duguetia flagellaris* (Pires & Silva 1623), part of large inflorescence.



Figure 7 - *Duguetia flagellaris* (Miralha et al. 225). A. Part of inflorescence with flower. B. Flower, with some of the petals removed.

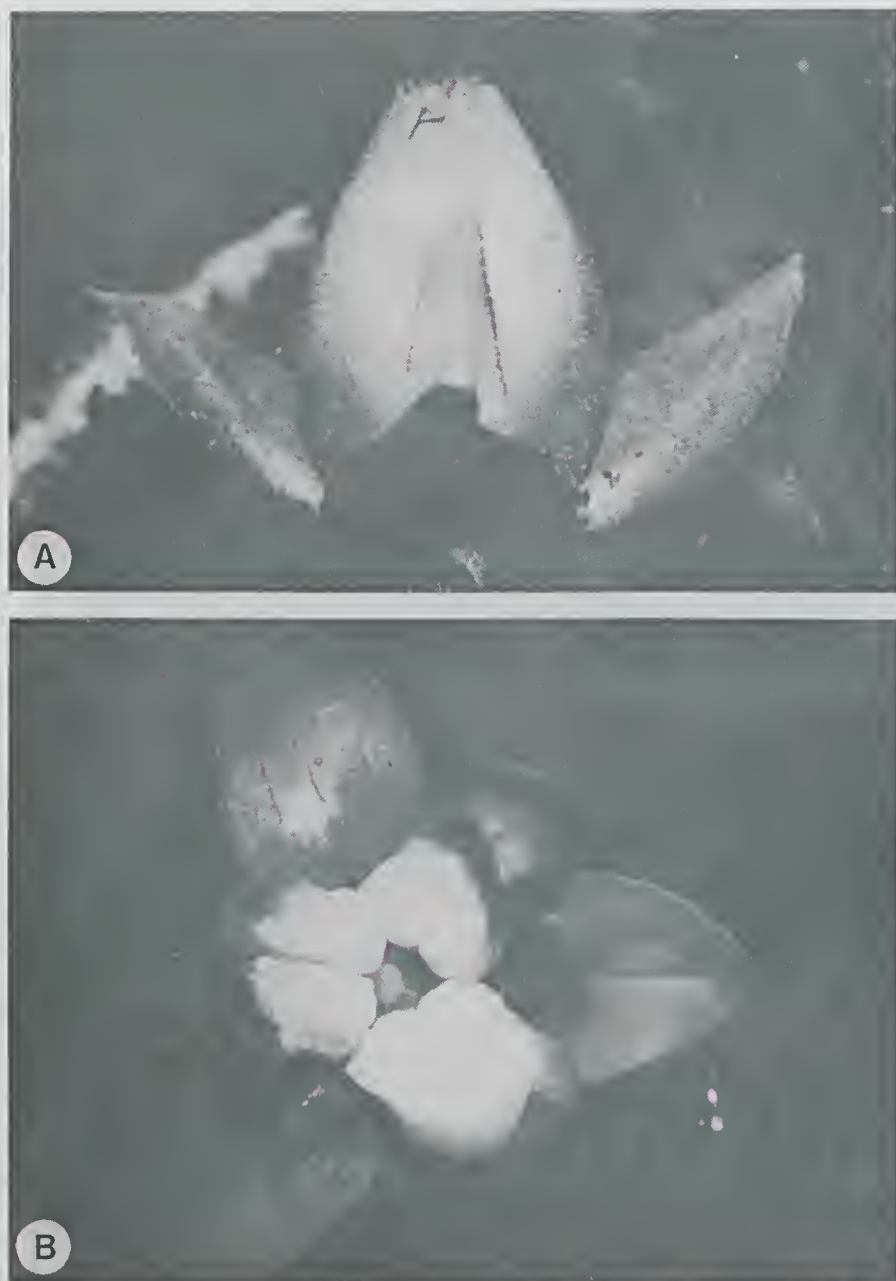


Figure 8 - *Duguetia flagellaris* (A, Miralha et al. 225) and *D. cadaverica* (B, Prévost 2188). A, Flower bud. B, Flower seen from above.

Shrub or tree, 1.5-10 m tall, 2-10 cm in diam. Young twigs ribbed, sparsely to rather densely covered with orange to brown stellate scales (0.1-0.2(-0.5) mm in diam.), older twigs grooved, red, dark brown or black, indument as on young twigs. Petioles 2-5(-9) mm long, 1-2(-3) mm in diam., sparsely to rather densely covered with orange, entire and stellate scales (0.1-0.2(-0.5) mm in diam.). Lamina narrowly elliptic to slightly (narrowly) obovate, chartaceous, pale to dark green above, light green below, (10-)13.5-23(-29.5) cm long, (3-)4-7.5(-9) cm wide, index 3-3.6, upper side glabrous, lower side sparsely covered with white, yellow or orange stellate scales and hairs ((0.1-)0.2-0.3 mm in diam.). base acute to attenuate, apex acuminate to acute, primary vein impressed on the upper side, secondary veins raised on the upper side, recurved to curved, 12-19 on either side of primary vein, angles with primary vein (50°-60°-85°), loop-forming at obtuse to almost right angles, loops distinct, smallest distance between loops and margin (2-)3-5 mm, tertiary veins raised on upper side, reticulate, marginal vein present. Inflorescences produced from ground level to 1.5 m up the trunk, sympodial with superposed rhipidia, 0.4-2 m long, 2-3(-5) mm in diam. Rhipidia spaced at a distance of mostly (2-)5-17 cm, generally separated by 2 internodes. Rhipidia 3-26(-34)-flowered, on peduncles 0-10 mm long, the sympodial rachis (8-)10-50(-70) mm long, pedicels (4-)7-10 mm long, 0.5 mm in diam., up to 2 mm in diam. just below flower, fruiting pedicel not distinctly increased in length. Bracts broadly ovate or ovate, 0.1-0.3(-0.5) mm long, caducous, rarely sympodial bracts foliaceous. Inflorescences including pedicels sparsely covered with orange to brown stellate scales (0.1-0.3(-0.5) mm in diam.); outer side of bracts and sepals, and flower buds, densely covered with orange stellate scales (0.1-0.3(-0.4) mm in diam.), the flower buds with smaller stellate hairs in addition; inner side of sepals very densely covered with white stellate hairs (0.1-0.2 mm in diam.); outer petals and the inner side of the inner petals very densely covered with orange and white entire scales and stellate hairs, the outer side of the inner petals with orange stellate scales only (all 0.1-0.3(-0.4) mm in diam.); sepals and petals becoming glabrous toward the base. Flower buds broadly ovoid to spheroid, (2-)4-6 mm long, (2-)4-6 mm in diam. Sepals yellowish pink to purplish brown (in vivo), connate at base, ovate, 6-11(-15) mm long, 3-8(-10) mm wide, acute. Petals red, pink, purple, to brown (in vivo). Outer petals elliptic to ovate, 11-20 mm long, (3-)5-8 mm wide, acuminate. Inner petals elliptic to ovate, 6-21 mm long, 3-8 mm wide, with fleshy tissue at base, acuminate. Torus depressed ovoid, 2-3 mm long, 4-7 mm in diam. Stamens pinkish-red (in vivo), 25-50, 1.2-1.5 mm long, 0.5-1 mm wide, apical prolongation acuminate, 0.2-0.7 mm long, densely covered with simple or stellate hairs.



Carpels 20-30, very densely covered with long, orange stellate hairs, stigma dark brown. Fruit pink to brown (in vivo), subglobose, (22-)30-45 mm in diam., basal collar composed of 7-9 sterile carpels, very densely covered with orange stellate hairs, carpels 13-28, spheroid, 16-24 mm long, 10-22 mm in diam., apiculate (apicule 2-3 mm long). Seed pale to dark brown, sometimes shiny, obovoid, surface smooth with striae.

Distribution. Colombia to Bolivia and to NE Brazil, absent from the Guianas. At altitudes up to 1200 m, on terra firme, humid and shady places, on oxisols, lateritic and clayey soils, in monsoon, cloud, high and tropical moist forests. Flowering throughout the year, but mostly between October and January, and fruiting from February to July (one fruiting collection in November).

Specimens examined. COLOMBIA. Amazonas: Araracuara, alt. ca. 200 m, 26 May 1991 (st), *Vester et al.* 346 (U). Antioquia: Mun. Anorí, above forest road Providencia-Alhibe, alt. 500-900 m, 29 Apr 1973 (fl), *Soejarto* 3951 (BM, F, GH, HUA, MO); Mun. Zaragoza, Corregimiento de Providencia, alt. 500-700 m, 12 Feb 1971, (fr) *Soejarto & Villa* 2808 (GH, HUA).

VENEZUELA. Amazonas: trail S from Cerro Neblina base camp ... on Río Mawarinuma ..., alt. 150-350 m, 3 May 1984 (fl), *Gentry & Stein* 47137 (U); 11 km NE of San Carlos de Río Negro, 15 nov 1977 (yfr), *Liesner* 3505 (MO); about 4 km E of San Carlos, alt. 119 m, 1982 (fr), *Uhl* 209 (MO).

ECUADOR. Napo: Cuyabeno, Quebrada la Hormiga, NW of Laguna Grande, alt. 200 m, 6 Nov 1987 (fl), *Hekker & Hekking* 10107 (U).

PERU. Huánuco: Agua Blanca, alt. 760 m, 16 Feb 1964 (st), *Schunke* V. 6684 (BM, F); near Tingo Maria, Monzón road to Puñulla, 25 Jun 1961 (st), *Mathias & Taylor* 5416 (F, K, US). Loreto: near Mishana, 1 Mar 1979 (st), *Gentry & Aronson* 25284 (U); Prov. Maynas, Iquitos, Allpahuayo ... Estación Exp. del IIAP, 2 Jun 1990 (st), *Vásquez & Jaramillo* 14042 (U). Madre de Dios: Tambopata, Nature Reserve, alt. ca. 260 m, 6 May 1980 (fr), *Barbour* 5195 (U); Tambopata Tourist Camp at junction of Ríos Tambopata and La Torre, alt. 280 m, 22 Jul 1985 (st), *Gentry et al.* 51092 (MO, U). San Martín: Prov. Mariscal Cáceres, Distr. Tocache Nuevo, Cerro Sinsín, 15 km W of Tocache Nuevo, along road to Puerto Pizana, alt. 550-580 m, 17 Dec 1981 (fl), *Plowman & Schunke* V. 11477 (F, GB, INPA, K, NY, U); Prov. Mariscal Cáceres, Distr. Tocache Nuevo, Road to Shunté, 4 Mar 1970 (fr, fl), *Schunke* V. 3840 (BM, F, G, GH, IAN, K, NY, MO, US, WIS); Prov. Mariscal Cáceres, Distr. Tocache Nuevo, Puerto Pizana, Río Huallaga, 13 Apr 1971 (fl, fr), *Schunke* V. 4814



(BM, F, G, GH, NY); Prov. Mariscal Cáceres, Distr. Tocache Nuevo, Quebrada de Cascarilla, NW of Puerto Pizana, alt. 350-370 m, 30 Jul 1973 (fr), *Schunke V. 6560* (F, GH, MO, NY).

BRAZIL. *Acre:* Cruzeiro do Sul, near the new airport, 30 km from town, 6 Feb 1976 (yfr), *Monteiro & Mota 129* (NY); near Brasileia, 1 Feb 1980 (fl, fr), *Nelson et al. 845* (R, U). *Amazonas:* Mun. Itapiranga, Rio Uatumã, 26 Aug 1979 (fl), *Cid et al. 844* (INPA, U); Manaus, Vareda Grande, 24 Oct 1956 (fl), *L. Coêlho & Chagas INPA4292* (INPA, S); Manaus, Reserva Florestal Ducke, 20 Jul 1966 (st), *Duarte 9819* (RB); Igarapé Curueuhi, São Gabriel, 27 Nov 1945 (fl, fr), *Fróes 21450* (IAN, NY, UC); right bank of Rio Negro, Ilha Tamanduá, near Carapanã, 18 Oct 1987 (fl), *Maas et al. 6776* (NY, U); Reserva Florestal Ducke, km 26 of road Manaus-Itacoatiara, 5 Oct 1990 (fl), *Miralha et al. 225* (INPA, U); km 28 of Manaus-Caracarái Road, 10 Nov 1966 (st), *Prance et al. 3048* (INPA, NY US); Santo Antonio de Abonari, km 220 of Manaus-Caracarái Road, 24 Nov 1976 (fl), *Prance et al. 24242* (NY, U); Manaus, Reserva Florestal Ducke, Picada P.E.-p.25, 26 Aug 1957 (st), *Rodrigues 557* (S); Manaus, Reserva Florestal Ducke, 27 Apr 1961 (fr), *Rodrigues & Lima 2429* (INPA). *Maranhão:* Mun. Monção, P.I. Guajá, Rio Turiaçu, 30 Jun 1987 (st), *Balée 3521* (NY); Rio Aripuanã, km 10 of road from Nucleo Pioneiro de Humboldt to Rio Juruena, 26 Oct 1973 (fl), *Berg & Steward P19877* (U); Basin of Rio Pindare, Monção, Sep-Dec 1940 (st), *Fróes 11975* (A, F, LIL, MICH, NY, SP, US); Rio Maracaçumé, 3 Jul 1958 (fr), *Fróes 34443* (IAN); Estrada BR 222, between Santa Inês and Açailândia, 124 km from Santa Inês, alt. 0-100 m, 16 Dec 1978 (fl), *Jangoux & Bahia 522* (MG, U). *Mato Grosso:* Rio Aripuanã, km 9.5 of road from Núcleo Pioneiro de Humboldt to Rio Juruena, 26 Oct 1973 (fl), *Berg & Steward P19895* (K, MO, NY, S, U, US); Aripuanã, Dardanelos, 26 Sep 1975 (yfl), *Lisboa et al. 297* (INPA). *Pará:* Mun. Oriximiná, Rio Trombetas, near Cachoeira Porteira, 18 Jun 1980 (fr), *Cid & Ramos 1060* (INPA); Mun. Oriximiná, Rio Mapuera, 28 Jun 1980 (yfl), *Cid & Ramos 1163* (INPA); Igarapé Caganchó, 1 km E of dam of Tucuruí, 29 Oct 1981 (fl), *Daly et al. 1051* (MG); E of Lago Salgado, Rio Trombetas, 24 Nov 1907 (fl), *Ducke MG8875* (BM, G, P, R, RB, US); Rio Branco de Óbidos, Repartimento, 23 Dec 1913 (st), *Ducke RB19625* (RB); Ariramba, Rio Trombetas, 4 Jul 1912 (fl), *Ducke MG11859a = RB43641* (RB); Rio Erepecurú, affluent of Rio Trombetas, 21 Oct 1913 (fl), *Ducke RB19626* (B, RB, U); Juruti Velho, 20 Dec 1926 (fl), *Ducke RB19627* (G, K, P, S, U, US); Lago Salgado, Rio Trombetas, 6 Feb 1927 (fr), *Ducke RB8657* (K, RB, S, U, US); Aguas Boas, Rio Pixiuna, affluent of Rio Cupary, 10 Apr 1924 (st), *Kuhlmann 1956* (RB);



Reserva Mocambo, near Belém, 17 Oct 1990 (fl), *Maas et al.* 7776 (MG, U); Upper Rio Tapajós, Cachocira de Chacorão, 22 Jan 1952 (fl), *J. M. Pires* 4004 (IAN); Colonia 3 de Outubro, 23 Jan 1953 (fl), *J. M. Pires & Silva* 4442 (IAN, INPA, NY); Gleba São Militão, 23 Apr 1987 (fr), *M. J. Pires & Silva* 1623 (INPA, MG); Gleba Itapcuara, 15 Jan 1988 (fl), *M. J. Pires & Silva* 1940 (MG); Gleba São Militão, Mt. Dourado, 21 Jan 1988 (fl), *M. J. Pires & Silva* 1963 (MG); Gleba Bacaja, Basin of Rio Xingu, 28 Nov 1980 (fl), *Prance et al.* 26524 (MG, U); between Tucuruí and Marabá, 19 Nov 1980 (fl), *Ramos et al.* 700 (INPA); Mun. Jacundá, Fazenda Moran, Rio Mojuzinho, affluent of Rio Tocantins, 4 Dec 1980 (fl), *Ramos et al.* 771 (INPA). *Rondônia*: km 278 of Porto Velho-Cuiabá Road, Jarú, 14 Feb 1983 (fr), *Teixeira et al.* 1526 (INPA, MG). *Roraima*: km 329 of Manaus-Caracarái Road, N of Waimari-Atoari Indian Reserve, 17 Nov 1977 (st), *Steward et al.* 70 (U); km 513 of Manaus-Caracarái Road, Acampamento Nova Paraíso, 21 Nov 1977 (fl), *Steward et al.* 117 (NY).

BOLÍVIA. *Pando*: ca. 30 km SW of Cobija, on road to Naraucda, alt. 250 m, 14 Aug 1982 (fl, fr), *Sperling & King* 6619 (U).

Local names and uses. Ameju preto ou ameiju (Brazil); Espintana, Espintana amarilla, Espintana negra (Peru); Palo de vara (Venezuela); Pina-i rapó, Pina'y (Brazil); Vara (Venezuela); Yara (Colombia). The root is used by Macunas, Colombian Amazonia, as an ingredient for arrow poison (*Vester et al.* 346).

In this species we included *D. heteroclada* and *D. trichostemon*. According to Fries (1941) both species differ from *D. flagellaris* in characters of base and apex of the lamina, and by smaller flowers, a different connective prolongation, larger leaves, and smaller stellate scales. However, these differences fall within the variation range of *D. flagellaris*.

D. flagellaris looks very similar to *D. cadaverica* in leaf characters, but it is quite distinct by the inflorescence structure. The flowers of *D. flagellaris* are concolorous, lacking the white center of the flowers of *D. cadaverica*.

Vegetative reproduction occurs through shoots ('saplings') formed at the end of inflorescence flagella (*Berg & Steward* 1989; *Maas et al.* 7776). Flower odor seems to vary quite a bit ("sweet scent of overripe pineapples": *Miralha et al.* 225; "flowers perfumed": *M. J. Pires & Silva* 1940; "foul smelling flowers visited by large flies": *Sperling & King* 6619, the only collection from Bolivia known to us), and more investigation is in order.



3. *Duguetia cadaverica* Huber, Bol. Mus. Paraense Hist. Nat. 5: 356. 1909; R. E. Fries, Acta Horti Berg. 12(1): 101. 1934. Type: Brazil. Pará: between Rio Cuminá-mirim and Ariramba, 18 Dec 1906 (fl), *Ducke MG7995* (holotype, MG; isotypes, BM, F, GH, RB). Figure 8B.

Geanthemum cadavericum (Huber) Safford, Contr. U.S. Natl. Herb. 18: 67. f.75. 1914.

Duguetia adiscandra Jansen-Jacobs, Proc. Kon. Ned. Akad. Wetensch. Ser. C. 73: 339. pl. 4. 1970. Type: Surinam. Sipaliwini River, N bank of Palaime Creek, 1 Mar 1963 (fl), *Wessels Boer 867* (holotype, U: 2 sheets).

Duguetia friesii Jansen-Jacobs, Proc. Kon. Ned. Akad. Wetensch. Ser. C. 73: 338. pl. 3. 1970. Type: Surinam. 2 Km NW of Base Camp on W bank of Linker Coppename River, 6 Feb 1965 (fl), *Florschütz & Maas 2767* (holotype, U: 2 sheets).

Shrub or tree, 1.5-7 m tall, 2-4 cm in diam. Young twigs grooved, reddish light brown, greyish, or almost black, rather densely covered with brown to orange stellate scales and hairs (0.1-0.3(-0.4) mm in diam.), older twigs sulcate, covered with greenish or white scabs, shiny, dark red brown to black, indument as on young twigs to almost glabrous. Petioles 2-8 mm long, 1-3(-5) mm in diam., rather densely covered with entire scales, stellate scales, and stellate hairs. Lamina narrowly elliptic to obovate, herbaceous, pale green to dark green above, brownish green, brown, or pale green below, 11-26 cm long, 3-8 cm wide, index 3.3-3.6, upper side glabrous, lower side sparsely covered with white, yellow, orange to brown entire scales, stellate scales, and stellate hairs ((0.1-) 0.2-0.4(-0.5) mm in diam.), base cuneate to acute, apex acuminate to acute, primary vein impressed on upper side, secondary veins raised on upper side, abruptly curved, (9-)11-18(-20) on either side of primary vein, angles with primary vein (45°-)55°-80°(-85°), loop-forming at obtuse to (almost) right (sometimes acute) angles, loops distinct, smallest distance between loops and margin (1-)2-4(-5) mm, tertiary veins raised on upper side, reticulate, marginal vein present. Inflorescences consisting of one to several greatly elongate rhipidia, 12-400 cm long, 1-7 mm in diam., internodes 0.2-7 cm long, pedicels 11-28(-40) mm long, 1 mm in diam. at the base, up to 2 mm in diam. just below the flower, fruiting pedicels 10-33 mm long, 2-3 mm in diam. Bracts ovate to depressed ovate, 2-8 mm long. Sympodial rachis densely covered with orange to white stellate scales. Outer side of bracts and flower buds very densely covered with orange entire scales and stellate scales (0.1-0.4(-0.6) mm in diam.).



Pedicels and outer side of sepals rather densely to densely covered with orange to almost white entire scales, stellate scales and stellate hairs ((0.1-)0.2-0.6 mm in diam.); inner side of sepals very densely covered with white to yellow stellate scales and spiderlike stellate hairs at apex (0.1-0.2 mm in diam.); outer side of outer petals and inner side of inner petals sparsely to rather densely covered with white to orange stellate scales and stellate hairs, especially at apex ((0.1-)0.2-0.6 mm in diam.); inner side of outer petals at apex sparsely to rather densely covered with white to orange stellate spiderlike hairs (0.1-0.6 mm in diam.); sepals and petals becoming less densely hairy or glabrous toward the base. Flower buds ovoid to broadly ovoid, up to 18 mm long, 12 mm in diam. Sepals sordid brown, brown or pale green (in vivo), connate at the base, ovate to broadly ovate, 10-23(-29) mm long, (4-)7-12(-15) mm wide, acute. Petals red to purple, the inner base white (in vivo). Outer petals ovate, 12-28(-33) mm long, (4-)6-12(-14) mm wide, acute. Inner petals ovate, with pronounced white fleshy swellings at base, 19-22(-28) mm long, 10-12 mm wide, acute. Torus depressed ovoid, 2 mm long, 4-6 mm in diam. Stamens 50-100, 0.8-3.0 mm long, 0.3-1.2 mm wide, apical prolongation of connective up to 0.8 mm long, acute, acuminate, obtuse, or absent. Carpels (13-)15-30, rather densely to densely covered with yellow to brown stellate hairs at base, stigma dark brown. Fruit dark to pale brown (in vivo), subglobose, 25-40 mm in diam., no basal collar present, carpels (6-)17-26, broadly obtrulloid, with 4-5 ribs, 12-17 mm long, 12-16 mm in diam., apiculate (apicule 1-3 mm long). Seed with smooth surface, pale brown, somewhat shiny.

Distribution. The Guianas and adjacent regions in the State of Pará, Brazil. In forests, on lateritic and granitic soil, at altitudes from sea level to 1000 m. Flowering mainly from July to February, fruiting from January to August.

Specimens examined. GUYANA. Along the Berbice-Rupununi Cattle Trail, Kuruduni Creek, 12 Jun 1920 (fl), *Abraham 304* (BRG, F, K, NY); Pakaraima Mts., summit of Ureisha Mt., 5 hr. walk above Tipuru Village, alt. 500-1200 m, 5 Jan 1982 (fl), *Knapp & Mallet 2865* (MO); Waraputa Compartment, NE of Mabura Hill, 28 Oct 1990 (fl), *Polak et al. 21* (U); Waraputa Compartment, 25 km S of Mabura, 14 Dec 1990 (fl), *Polak 199* (U).

SURINAM. Wilhelmina Mts., 13 May 1926 (fl), *BW 7238* (U); Emma Range, near Main Camp, alt. 315 m, 25 Jul 1959 (fl), *Daniëls & Jonker 740* (U); Emma Range, 1 km from Main Camp, alt. 350 m, 3 Sep 1959 (fl), *Daniëls & Jonker 935* (U); Emma Range, South Camp, alt. 565 m, 18 Sep 1959 (fl), *Daniëls & Jonker 1159* (U); Litani River, Koele Koele Creek, 21 Jul 1985 (fl),



Feuillet 2500 (U); foothills of Bakhuis Mts., 2 km W of base camp on Linker Coppename River, 2 Feb 1965 (fl), *Florschütz & Maas 2702* (U); E slopes of Bakhuis Mts, alt. 873 m, 20 Feb 1965 (fr), *Florschütz & Maas 2897* (U); Coppename River, Hebiweri, 3 Dec 1943 (fl), *Geijskes 1030* (U); ca. 3 km S of Juliana Top, 12 km N of Lucie River, alt. 300 m, 8 Aug 1963 (fl), *Irwin et al. 54601* (B, INPA, NY); Coppename River, between Camps 3 and 4, 23 Jul 1944 (yfl), *Maguire 24159* (U); Coppename River, between Camps 3 and 4, 23 Jul 1944 (st), *Maguire 24159A* (NY); Wilhelmina Mts., 9 km N of Lucie River, 12 km W of Oost River, alt. 275 m, 13 Jul 1963 (fl, fr), *Maguire et al. 54321* (NY, S, US); 3 km S of Juliana Top, 12 km N of Lucie River, alt. 1000 m, 26 Jul 1963 (fl), *Maguire et al. 54350* (NY, US); 3 km S of Juliana Top, 12 km N of Lucie River, alt. 300 m, 1 Aug 1963 (fl), *Maguire et al. 54425* (NY); Kayser Mts., old GMD Camp II, ca. 9 km SW of Kayser Airstrip, 29 Oct 1976 (fl), *Mori & Bolten 8582* (NY); Kayser Mts., vicinity of GMD Camp III, ca. 18 km SW of the Kayser Airstrip, 8 Nov 1976 (yfl), *Mori & Bolten 8626* (NY); Sipaliwini savanna, 2.5 km S of Sipaliwini River, Feb 1970 (fl), *Oldenburger et al. 1408* (BBS, K, U); Wilhelmina Mts., S of Juliana Top, alt. 350 m, 6 Aug 1983 (fl), *Schulz LBB10335* (BBS, NY, U); Upper Suriname River, Oct 1908 (infl. only), *Tresling 493* (U).

FRENCH GUIANA. Piste de Kaw, km 34, alt. 340 m, 23 Nov 1989 (fl), *Billiet & Jadin 4578* (BR); Crique Gabaret, Oyapock River, alt. 30 m, 16 Apr 1988 (fl, fr), *Cremers 9963* (U); Arataye River, Saut Pararé, affluent of Approuague River, 1 Feb 1969 (fl), *de Granville et al. 5* (NY, P, U); Montagne de la Trinité, NE summit, 26 Jan 1984 (fr), *de Granville 6301* (B, K, P, U); Montagne de la Trinité, NE summit, alt. 620 m, 3 Feb 1984 (st, fr), *de Granville et al. 6481* (G, U); Montagne Bellevue de l'Inini, alt. 550 m, 27 Aug 1985 (fl), *de Granville et al. 7865* (P, U); Mt. Galboa, near NW summit, alt. 600 m, 10 Jan 1986 (fl), *de Granville et al. 8579* (U); Mt. de Kaw, Crique Daï-Daï, alt. 30 m, 18 Nov 1987 (fl), *de Granville 10152* (U); Route Forestière de Belizon, alt. 25 m, 22 Nov 1987 (fl), *de Granville 10192* (U); Station des Nouragues, basin of Arataye River, alt. 100 m, 4 Aug 1989 (fl), *de Granville et al. 11031* (U); Crique Portal, S of Saint Laurent, 11 Nov 1975 (fl), *Normand s.n.* (P); Piste de St. Elic, km 15.7, 28 Sep 1984 (st), *Prévost 1642* (U); Station des Nouragues, basin of Arataye River, 23 Aug 1987 (st), *Riera 1351* (CAY, U); Approuague River, Arataye River, Saut Pararé, 19 Aug 1977 (fl), *Sastre 5738* (P, U); Montagne des Singes, 74 km W of Cayenne, near Kourou, alt. 100 m, 18 Mar 1985 (fl), *Skog 5632* (U).



BRAZIL. Pará: Santarém, near Cachocira Palhão, 4 Dec 1966 (fl), *Cavalcante & Silva 1577, 1578* (IAN, MG); Gurupá, 28 Dec 1916 (fl), *Ducke MG16687 = RB13612* (B, BM, RB); km 1133 of Cuiabá-Santarém Highway (BR 163), vicinity of Igarapé Natal, 16 Nov 1977 (fl), *A.S. Silva et al. P25500* (MG, NY, U).

Uses. A tea from boiled bark of this species is used by Makushi Indians to cure diarrhoea (*Knapp & Mallet 2865*).

Morphologically, *Duguetia cadaverica* is well distinct from the other two species in this section because of the inflorescences which essentially consist of extremely protracted single rhipidia, rather than sympodially superposed rhipidia. For further differences, see the comments with the other species.

A curious feature of *D. cadaverica* is the variation in the apical prolongation of the connective: pointed, rounded (semiglobose), or the connective not prolonged. This is unusual within a single species.

D. adiscandra and *D. friesii* were described only recently. *D. adiscandra* is supposed to be distinct from *D. cadaverica* in the shape of the leaves and the sepals. However, after examination of a fair number of collections it has become obvious that these differences do not hold, and that *D. adiscandra* must be regarded as a synonym of *D. cadaverica*. *D. friesii* was thought to come closest to *D. flagellaris*; the markedly different inflorescence structure between the two species does not seem to have been noticed either by Fries (1934) or by Jansen-Jacobs (1970). Furthermore, *D. friesii* possesses a semiglobose appendage of the connective. As said above, the shape and presence of the connective prolongation are variable in *D. cadaverica*, hence, there seems little reason to maintain *D. friesii* as a separate species.

ACKNOWLEDGEMENTS

Material was studied from the following herbaria: A, B, BBS, BM, BR, BRG, C, CAY, ECON, F, G, GB, GH, GUA, HBG, HUA, IAN, INPA, K, LIL, MG, MICH, MO, NY, P, R, RB, S, SP, U, UC, US, WIS. Our sincere thanks go to all curators for making this material available.

We want to thank in particular some of our colleagues who helped us in various ways: D. Araujo (Brazil), F. Billiet (Belgium), C. Farney (Brazil), M. F. Prévost (French Guiana), and the late T. Plowman (USA). We are also most grateful to several staff members at INPA and MG who assisted the senior



author in the field, and to J. C. Lindeman (U) for providing a Portuguese summary.

BIBLIOGRAFIC REFERENCES

- EICHLER, A. W. 1883. *Anona rhizantha* n.sp. Jahrb. Königl. Bot. Gart. Berlin 2: 320-323.
- FRIES, R. E. 1900. Beiträge zur Kenntnis der Süd-Amerikanischen Anonaceen. Kongl. Svenska Vetenskapsakad. Handl., n.s., 34(5): 24.
- FRIES, R. E. 1919. Studien über die Blütenstandsverhältnisse bei der Familie Anonaceae. Acta Horti Berg. 6(6): 3-48.
- FRIES, R. E. 1934. Revision der Arten einiger Anonaceen-Gattungen. Acta Horti Berg. 12(1): 96-102.
- FRIES, R. E. 1937. Revision der Arten einiger Anonaceen-Gattungen. Acta Horti Berg. 12(2): 283-286.
- FRIES, R. E. 1941. Neue Amerikanische Anonaceen. Acta Horti Berg. 13(3): 113-114.
- FRIES, R. E. 1949. Sobre la cauliflora en la familia de las Anonáceas. Lilloa 16: 251-261.
- FRIES, R. E. 1959. Annonaceae. In: ENGLER, A. & K. PRANTL., Nat. Pflanzenfam. ed. 2, 17all. pp. 13-22, 53-58.
- HUBER, J. 1909. Materiaes para a flora amazonica. VII. Plantae Duckeanae austro-guyanenses. Bol. Mus. Paraense Hist. Nat. 5: 355-356.
- JANSEN-JACOBS, M. J. 1970. New species of Annonaceae from Suriname. Proc. Kon. Ned. Akad. Wetensch. Ser. C. 73: 338-339.
- MAAS, P. J. M. & L. Y. Th. WESTRA. 1985. Studies in Annonaceae. II. A monograph of the genus *Anaxagorea* A. St. Hil. Part. 2. Bot. Jahrb. Syst. 105: 152-154.
- MAAS, P. J. M. et al. 1986. Studies in Annonaceae. VII. New species from the Neotropics and miscellaneous notes. Proc. Kon. Ned. Akad. Wetensch. Ser. C. 89: 256-260.
- SAFFORD, W. E. 1914. Classification of the genus *Annona* with descriptions of new and imperfectly known species. Contr. U.S. Natl. Herb. 18: 66-67.

Recebido em 26.10.92
Aprovado em 02.02.93



LIST OF EXSICCATAE

- Abraham, A. A., 304 (3)
Araujo, D. et al., 7266 (1)
Balée, W. L., 20, 3521 (2)
Barbour, P. J., 5195 (2)
Berg, C. C. & Steward, W. C., P19877, P19895 (2)
Billiet, F. & Jadin, B., 4578 (3)
BW, 7238 (3)
Cavalcante, P. B. & Silva, M. G., 1577, 1578 (3)
Cid, C. A. [et al.], 844, 1060, 1163 (2)
Coêlho, L. & Chagas, J., INPA4292 (2)
Cremers, G., 9963 (3)
Daly, D. C. et al., 1051 (2)
Daniëls, A. H. G. & Jonker, F. P., 740, 935, 1159 (3)
Duarte, A. P., 9819 (2)
Ducke, A., MG7942 (2); MG7995 (3); MG8875, MG11859a = RB43641 (2);
MG16687 = RB13612 (3); RB8657, RB19625, RB19626, RB19627, 17
= RB23906 (2)
Farney, C., 2459 (1)
Feuillet, C., 2500 (3)
Florschütz, P. A. & Maas, P. J. M., 2702, 2767, 2897 (3)
Frazão, A., RB7140 (1)
Frócs, R. L., 11975, 21450, 34443 (2)
Geijskes, D. C., 1030 (3)
Gentry, A. H. [et al.], 25284, 47137, 48948, 49028, 49056, 49075, 49090,
51092, 69134, 69252 (2)
Glaziou, A. F. M. [et al.], 13511, 15823, 18842 (1)



- Granville, J.J. de [et al.], 5, 6301, 6481, 7865, 8579, 10152, 10192, 11031 (3)
Haught, O., 1554 (2)
Hekker, F. & Hekking, W. H. A., 10107 (2)
Hoehtne, F. C., 133 = SP24595 (1)
Irwin, H. S. et al., 54601 (3)
Jangoux, J. & Bahia, R. P., 522 (2)
Knapp, S. & Mallet, J., 2865 (3)
Kuhlmann, J. G., 1956 (2)
Liesner, R. L., 3505 (2)
Lisboa, P. et al., 297 (2)
Maas, P. J. M. et al., 6776, 7776 (2)
Maguire, B. [et al.], 24159, 24159A, 54321, 54350, 54425 (3)
Mathias, M. E. & Taylor, D., 5416 (2)
Mikan, J. C., 7 (1)
Miralha, J. M. S. et al., 225 (2)
Monteiro, O. P. & Mota, C. D., 129 (2)
Mori, S. A. & Bolten, A., 8582, 8626 (3)
Nelson, B. W. et al., 845 (2)
Normand, D., s.n. (3)
Oldenburger, F. H. F. et al., 1408 (3)
Peckolt, G., 1 (1)
Pires, J. M. [et al.], 4004, 4442 (2)
Pires, M. J. & Silva, N. T., 1623, 1940, 1963 (2)
Plowman, T. C. & Schunke V., J., 11477 (2)
Pohl, J. B. E., s.n. (1)
Polak, M. [et al.], 21, 199 (3)



- Prance, G. T. et al., 3048, 24242, 26524 (2)
Prévost, M. F., 1642 (3)
Ramos, J. F. et al., 700, 771 (2)
Ricra, B., 1351 (3)
Rodrigues, W. A. [et al.], 557, 2429 (2)
Sastre, C., 5738 (3)
Schulz, J. P., LBB10335 (3)
Schunke V., J., 3840, 4814, 6560, 6684 (2)
Shepherd, J. D., 832 (2)
Silva, A. S. et al., P25500 (3)
Skog, L. E., 5632 (3)
Soejarto, D. D. [et al.], 2808, 3951 (2)
Sperling, C. R. & King, S., 6619 (2)
Steege, H. ter, 619 (3).
Steward, W. C. et al., 70, 117 (2)
Teixeira, L. O. A. et al., 1526 (2)
Tresling, J., 493 (3)
Uhl, C. F., 209 (2)
Ulc, E., s.n. (1)
Vásquez, R. & Jaramillo, N., 14042 (2)
Vester, H. et al., 346 (2)
Vilhena, R., INPA55921 (2)
Wessels Boer, J. G., 867 (3)

